Bird Track Springs Fish Habitat Enhancement Project
Fish and Aquatic Resources Specialist's Report

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1. Introduction

Since the 1990s, restoring watershed processes has been widely accepted as the key to restoring watershed health and improving fish habitat (Roni et al . 2002). In the Upper Grande Ronde River Tributary Assessment (Bureau of Reclamation 2014) four moderately confined to unconfined reaches were identified including the area of the proposed project, the “Birdtrack/Longely Reach.” The Birdtrack Longely Reach was determined to be the only unconfined geomorphic reach with a high potential to improve the overall physical and ecological processes that supports species listed as Threatened under the Endangered Species Act (ESA).

The Bird Track Springs Fish Habitat Enhancement Project is located in the Upper Grande Ronde Subbasin (HUC 17060104). The project area boundary includes portions of three subwatersheds; Coleman Ridge-Grande Ronde River (HUC 170601040307), Jordan Creek subwatershed (HUC 170601040303), and Lower Beaver Creek (HUC 170601040302). The project area boundary includes approximately 6,287 acres. This includes acres adjacent to the Grande Ronde River (GRR) used for access, staging and storing materials and equipment, riparian planting, and acres on the Jordan Creek Ranch where trees would be harvested to be used for instream restoration. The Bird Track Springs Fish Habitat Enhancement Project extends approximately two miles along the mainstem upper Grande Ronde River between river mile 146.1 and 144.2. The reach proposed for instream treatment includes Wallowa-Whitman National Forest and private lands along State Highway 244 within the Grande Ronde recovery plan assessment units UGC3A and UGS16. Approximately 1.2 miles of river are on the Wallowa-Whitman National Forest, 0.1 miles are on state land, and 0.6 miles are on private land. The upstream extent of the reach is just upstream of the Bird Track Springs Campground and the downstream extent is near the boundary of the Bear Creek Ranch. The primary purposes of the project include restoring degraded riparian and floodplain function and habitats, improving instream habitat diversity, and improving water quality for adult and juvenile summer steelhead (*Oncorhynchus mykiss*) and spring Chinook salmon (*O. tshawytscha*).

Three species in the Upper Grande Ronde Subbasin are listed as Threatened under the ESA:

> Snake River spring/summer Chinook (*Oncorhynchus tshawytscha*), ESA listed as Threatened, January 5, 2006 and updated on April 14, 2014. (http://www.nwr.noaa.gov/publications/frn/2005/70fr37160.pdf)
>
> Snake River Basin steelhead (*Oncorhynchus mykiss*), ESA listed as Threatened, January 5, 2006 and updated on April 14, 2014. (http://www.nwr.noaa.gov/publications/frn/2006/71fr834.pdf)
>
> Columbia River bull trout (*Salvelinus confluentus*), ESA listed as Threatened, June 10, 1998. (http://www.fws.gov/pacific/bulltrout/)

An additional 2 fish species are listed on the Region 6 Sensitive Species List:

> Redband trout (*Oncorhynchus mykiss gibbsi*) are present in the Upper Grande Ronde Subbasin and are listed as a sensitive species by the U.S. Fish and Wildlife Service, and NOAA Fisheries (NPCC 2004).
>
> Pacific lamprey (*Lampetra tridentate*) were reintroduced into the Grande Ronde River in 2014 and 2015 and have an unknown distribution. They are listed as a sensitive species by the U.S. Fish and Wildlife Service, and NOAA Fisheries (NPCC 2004).

Four additional species of aquatic mollusks are on the Region 6 Sensitive Species List and are suspected to occur on the Wallowa Whitman National Forest:

Western Ridged Mussel (*Gonidea angulata*)
Shortfaced Lanx (*Fisherola nuttalli*)
Columbia Pebblesnail (*Fluminicola fuscus*)
California floater (*Anodonta californiensis*)

Two frog species are on the Region 6 Sensitive Species List and are documented on the Wallowa Whitman National Forest (both frog species are covered under the Biological Evaluation for Wildlife for Bird track Springs Fish Enhancement Project):

Columbia Spotted Frog (*Rana luteiventris*)
Inland Spotted Frog (*Ascaphus montanus*)

Background

Dating back to the early 1900s activities that have caused riparian and instream habitat degradation have adversely affected spring Chinook salmon, steelhead and bull trout production potential in the Upper Grande Ronde Subbasin. Sediment, water temperature, low stream flows and, habitat quality and quantity are the most critical limiting factors for these salmonid populations. These habitat limitations are the result of several anthropogenic disturbances that include, but are not limited to, the following: surface water diversions for agriculture, turning floodplains into pastures, livestock grazing, hydraulic mining, logging and use of splash-dams, roads, and fire suppression (McIntosh 1992). Although many of these impacts have been reduced in recent years their effects still persist throughout the subbasin.

The existing upper Grande Ronde River in the Bird Track Springs reach is an unconfined, free-formed alluvial channel that has a straight planform with a plane-bed, and lower degree of channel-floodplain interactions compared to historic conditions. Artificial channel constrictions and disconnected floodplains do to railroad grades, road grades and levees have changed the channel geometry and floodplain cross-sectional area which increases flow depths, flow velocities and shear stresses during high water events. This condition translates into increased sediment mobilization and transport resulting in a wider, shallower channel with an armor layer that inhibits pool development when flows are not sufficient to mobilize the armoring particles, or in the absence of channel-spanning structures or significant channel constrictions.

Existing riparian vegetation conditions include scattered patches of woody shrubs and immature trees, and large areas of herbaceous vegetation where the floodplain has been cleared and drained for ranching. Beavers are not common and no longer play a major role in wood delivery to the channel, maintaining diverse off-channel habitats and riparian conditions, or maintaining stable habitat for fish during the winter by creating habitat with consistent water levels, very low current velocities and stationary ice cover (Jackober et al. 1998).

Icing has been a significant process during low flows in the winter months due to the wider, shallower channel geometry in the project area. Trees with ice scars have been identified in the upper .5 miles of the channel in the Bird Track Springs project area and provide an indication of longitudinal ice scour extent. These trees show height of scour occurring consistently above the 100-year water surface elevation. Surface ice accumulation can be significant during winter months to the point of creating large ice dams. Salmonids overwintering in rivers such as the Grande Ronde are vulnerable to numerous threats to their survival as a result of highly variable environmental conditions due to fluctuations in water temperatures, discharge and ice conditions (Brown et al. 2011). Anchor ice effects on salmonids include filling pools or other habitat and displacing fish, and creating high-velocity conduits for water to flow through that create velocities that are unsuitable for fish to maintain position (Brown et al. 2011). Research has shown that fish are forced to make larger numbers of movements when influenced by frazil ice or anchor ice, which demands using limited stores of energy in their bodies during the winter and increases the probability of mortality (Brown et al. 2011). Studies have found that bull trout and cutthroat trout moved more often in streams affected by anchor ice than in streams with stationary ice cover (Jakober et al. 1998). In addition, incubating embryos and alevins can be killed when frazil or anchor ice forms in streams and reduces water interchange between the stream and the red (Bjornn and Reiser 1991). Anchor ice normally forms in shallow water typical of spawning areas and may completely blanket the substrate. Ice dams may impede flow or even dewater spawning areas. When dams melt, the water released can displace the streambed substrate and scour redds (Bjornn and Teiser 1991). The formation of ice dams and their subsequent failure can result in scouring the stream bed and damaging banks and riparian vegetation.

Purpose and Need

The purpose and need for the proposed action is to re-establish hydraulic conditions creating a mosaic of diverse habitat types, improving channel-floodplain interactions and function to increase connectivity, dissipate high-water flows, and address winter ice issues; and improve riparian vegetation condition and streambank stability within this reach of the GRR. Physical process restoration would lead to meeting the desired conditions of the Wallowa-Whitman Forest Plan, as amended, by addressing limiting factors for long-term support of the recovery of ESA listed salmonids within the GRR system.

ESA Listed Fish

All three species listed under the ESA as threatened occur within the planning area and the planning area is designated critical habitat for these species. Other fish species on the Region 6 Sensitive Species list include redband trout (*Oncorhynchus mykiss gibbsi*) and pacific lamprey (*Lampetra tridentate*) and four aquatic mollusks are on the Region sensitive species list (as updated July 2015). Improving fish and aquatic habitat within the proposed treatment reach would aid in ensuring habitat quality is available for the recovery of fish.

The preliminary ESA effects determination for the proposed action is "Likely to Adversely Affect" to all three fish species and their designated critical habitat due to short-term disturbance, sedimentation, and turbidity related to in-stream activities (Bonneville Power Administration Habitat Improvement Program Habitat Improvement Program III). Over the mid- to long-term, the project is expected to substantially improve habitat conditions and promote recovery for all three species. Effects of habitat improvement on fish may begin to occur immediately following completion of instream work and would be expected to continue to improve as riparian vegetation establishes, floodplain function is restored, and in channel habitat features such as scour pool development occurs.

2. Affected Environment

Selected Indicators from the "Matrix of Pathways and Indicators" from the 1996 NMFS document *Making Endangered Species Act Determinations of Effects for Individual or Grouped Actions at the Watershed Scale* and 1998 USFWS *A framework to assist in making Endangered Species Act determinations of effect for individual or grouped actions at the bull trout subpopulation scale* were used to analyze effects of the no action and proposed action alternatives on fish and aquatic species and their habitat. Indicators selected from the matrix are representative of habitat indicators that can be affected by large wood installation, channel realignment and rehabilitation, and floodplain function.

Indicators selected from the matrix are:

- Temperature
- Sediment
- substrate embeddedness
- large woody debris
- pool frequency and quality
- large pools,
- width/depth ratio,
- stream bank condition, and
- function of riparian areas

Table 1 illustrates how each of these indicators is currently functioning within the Upper Grande Ronde subbasin. Function ratings are considered to be either properly functioning, functioning but at low levels and at risk of becoming not properly functioning (functioning at risk), and not properly functioning.

The three categories in Table 2 that rate the condition of each habitat indicator are properly functioning, functioning at risk, and not properly functioning. For each habitat indicator there is a definition or description for each of the three categories, described in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS, 1996). The ranges for criteria in described in this document are not meant to be absolute and may be adjusted for unique watersheds or channel reaches.

Table 1. Selected Indicators from the Matrix of Pathway and Indicators (NMFS 1996, USFWS 1998)

Indicator	Reach Scale		
	Properly functioning	Functioning At Risk	Not Properly functioning
Temperature			X
Sediment			X
Substrate Embeddedness			X
Large Woody Debris			X
Pool frequency and quality			X
Large Pools			X
Width/Depth Ratio			X
Streambank Condition		X	
Riparian Reserve (RHCAs)		X	

Temperature

Fish are cold blooded animals in which the environmental conditions of the stream control their body temperature. Because water temperature affects the body temperature of fish, it can regulate activity and physiological processes (Thompson and Larsen 2004). Stream temperature directly influences aquatic organisms' physiology, metabolic rates, and life history behaviors and influence aspects of important processes of habitat for fish and aquatic species such as nutrient cycling and productivity (Allen 1995). Interactions between external drivers of stream temperature such as air temperature, solar radiation, and wind speed and the internal structure of the stream system such as the channel, riparian zone, and alluvial aquifer, drive temperature (Poole and Berman 2001).

Oregon's 2012 303(d) List of Water Quality Limited Waterbodies identified seven parameters, including temperature, for the Upper GRR within the project. Seven parameters in the upper GRR do not meet standards for beneficial use including conditions suitable for fish. A total maximum daily load (TMDL) and a Water Quality Management Plan were prepared for the Upper Grande Ronde Sub-Basin in 2000 to address the water quality problems (ODEQ 2000). Due to the predominance of non-point source pollutants, the plan relies largely on habitat restoration to achieve the TMDL goals. Water quality parameters (and standards) of temperature (64°F/55°F, rearing/spawning), relate to the beneficial use for fish life (NPCC 2004). Although fish can function in a wide range of temperatures, they have an optimum range as well as lower and upper lethal temperature for various activities, life stage, and species (Beschta et al. 1987). The standard for a "properly functioning" channel for temperature habitat indicator in the project area is a Maximum Average Weekly Temperature (MWAT) that does not exceed 50-57° F (NMFS 1996). The standard for functioning at risk is 57-60° for spawning fish and 57-64° for migrating and rearing fish. MWAT temperatures over 60° for spawning fish and over 64° for migration and rearing are considered "not properly functioning." It is uncertain whether the Grande Ronde River in the project area ever met the 50-57° temperatures even before the extensive floodplain and channel modification and history of management.

Maximum Average Weekly Temperature (MWAT) have greatly exceeded the 64° threshold (Figure 1). The majority of days in July and August reach temperatures above 64° for some duration with the highest average temperature weeks near or over 74°F (CHaMP 2015) for the GRR in the Bird Track Springs area. This is close to the lethal limit for juvenile rearing for salmonids, including ESA listed species in the project area, which is considered 77.4°F for Chinook and 75.4°for steelhead (Thompson and Larsen 2004), which is one reason this reach receives very little utilization by rearing salmonids.

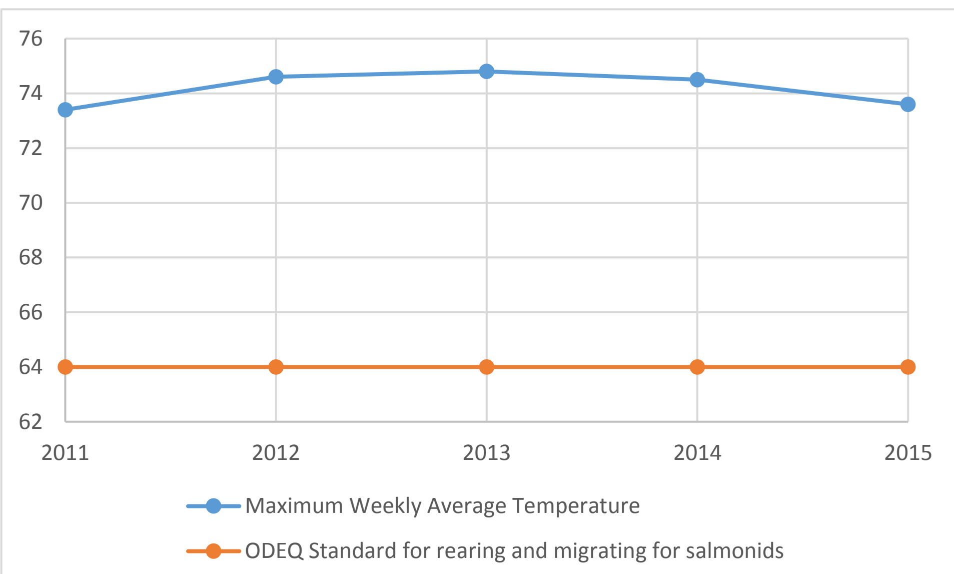

Figure 1. Grande Ronde River at Bird Track Springs MWAT

Sediment and Turbidity

Fine sediment in the Grande Ronde River mainstem has been identified as being excessive from Five Points Creek confluence to the headwaters, this includes the project area (UGR TDML 2000).

In the AQI survey (2015) that encompassed the project area found gravel, cobble and sand as the dominant stream substrates. The survey found stream substrates of 54% gravel, 20% cobble, and 20% sand (<2 mm). In the survey just downstream of Bear Creek, downstream of the project area sand and fine sediment made up 34% of channel substrate (<2 mm). The standard for a "properly functioning" channel for the sediment and turbidity habitat indicator is <12% fines (0.85 mm), “functioning at risk” is 12-20% fines and moderate turbidity, and “not properly functioning” is >20% fines at surface or depth in spawning habitat, and turbidity high.

Because the project area and immediately downstream of the project area have elevated sediment loads, at a reach level, the GRR in the project area is “not properly functioning.”

Large Woody Debris

The 2015 Aquatic Inventory Surveys (AQI) by Oregon Department of Fish and Wildlife Service found a total of 22 pieces of wood per mile (minimum size >15cm diameter and >3m long) in the project area, and 9 pieces of wood considered “key” wood per mile (minimum 30cm diameter and 6->15m in length.

The NMFS (1996) “properly functioning” standard for LWD for streams east of the Cascade crest in Oregon, Washington, and Idaho is a minimum of 20 pieces of LWD per mile, which have a minimum 12 inch diameter and 35 feet length and an adequate source of LWD for future recruitment in riparian areas (Table 2). The 2015 AQI survey found a total of 9 pieces of wood per mile in the size class. This survey included 2.46 miles of stream including the mainstem GRR and side channels in the project area. The GRR and side channels in the project area are “not properly functioning” because the RMO for pieces of LWD per mile is not met and the riparian area lacks potential for large woody debris recruitment.

Table 2. Large Woody Debris counts in BTS project area and adjacent reaches

Large Wood Indicators	PFC Levels	Reach
	Properly Functioning Levels	Project Area
Total Wood (pieces/mile)	N/A	22
Key Pieces (pieces/mile)	>20	9

LWD numbers in this table are from AQI, 2015

Pool Frequency, Quality, and Large Pools

Pools provide refuge and cover to fish and aquatic organisms, for protection from predators as well as important living space. Space requirements vary with fish species, age, and time of year. Amount of living space necessary can increase with age and size of the fish (Bjornn and Reiser 1991). Living space for salmonids, such as pool area has been related to fish biomass. Carrying capacity of fish for a stream has been found to be dependent on morphology including channel shape and streamflow (Thompson and Larson 2004).

McIntosh (1992) calculated that from 1941 to 1990 the GRR large and total pool densities decreased by 71% (1.1 pools /km) to 78% (1.4 pools/km) respectively. In the vicinity of the project area, CHaMPs surveys found 8 pools/1.1 kilometers (or approximately 12.8 pools/mile) in the mainstem GRR just downstream of the project boundary in 2015 and 1 pool/.5km (or approximately 3 pools/mile) in a reach near the upstream extent of the project area in 2016. A channel the size of the mainstem GRR through the project area would be “properly functioning” if it had a minimum of 26 pools per mile, the RMO for pools per mile, and met the large woody debris recruitment standards in the riparian area (NMFS 1996). The description of a reach in “not properly functioning” condition is “does not meet pool frequency standards.” Therefore the GRR through the project area is in “not properly functioning” condition.

Table 3. Pool frequency in BTS project area

Indicators	PFC Levels	Reach	
	Properly Functioning Levels	CHaMPs Reach Downstream	CHaMPs Reach Upstream
Pools/mile	26	12.8	3

Streambank Condition

Current streambank conditions are considered to be "functioning at risk" based on channel morphology observations including lateral stream migration and accelerated bank erosion actively contributing to the sediment load of the GRR. Major influences to the existing conditions are likely loss of riparian vegetation and the history of logging and grazing practices and the dynamics associated with icing and ice dams where ice dam failure can result in scouring the stream bed and damaging banks and riparian vegetation. At the downstream most extent of the project area on the boarder of Bear Creek Ranch on the mainstem channel, a headcut has begun just downstream of the split flow on river right.

It is estimated that the GRR in the project area has 80-90% stable banks, which falls into the "functioning at risk" category. For a reach to be "properly functioning," on average less than 10% of banks are actively eroding.

Width/Depth Ratio

The width to depth ratio is a good indicator of channel cross section shape and as the ratio increases generally so does the incidence of degradation. As a stream becomes wider and shallower this ratio increases.

The Bird Track Springs reach of the Grande Ronde is a relatively simplified, wide, and shallow channel. The width to depth ratio is 39.2 (AQI 2015) in this section of the GRR. This shows an extremely over-widened channel in areas without significant large wood, resistant bank material, and adequate riparian vegetation. This type of channel, Rosgen (1996) stream type C4, have a width to depth ratio range of 13.5 to 28.7. The width to depth ratio in the project area indicates an extremely wide and shallow channel. The channel has also lost connectivity with the floodplain at most flows and it is believed that the loss of interaction has reduced the storage capacity and slow release of water from the floodplain throughout the summer months. For this indicator Rosgen (1996) range was used instead of the very general NMFS (1996) categories because it is specific to stream type. This indicator is rated as "not properly functioning."

Figure 2. Downstream extent of project area, wide channel lacking wood or habitat structure. Photo credit AQI 2015

Table 4. Width to Depth Ratio in BTS Project Area

Indicators	Rosgen C4 Channel Range (PFC)	Project Area Reach
Width to Depth Ratio	13.5-28.7	39.2

Riparian Habitat Conservation Areas

Riparian vegetation in the UGR Subbasin was found to be a limiting factor by the Expert Panel for the Upper Grande Ronde Subbasin provided by Reclamation's Columbia/Snake River Salmon Recovery Office in 2013. Riparian vegetation and large wood recruitment was identified as an ecological concern and limiting factor.

It is assumed that prior to Euro-American settlement and associated disturbances, the upper GRR developed under an intermittent disturbance regime where flows, sediment inputs and large wood dynamically interacted to create successional states (Lyon 2015). Riparian vegetation likely included woody species such as cottonwood, willow, river birch and alder of varying ages (seral stages). The upland areas adjacent to the active floodplain likely supported mature Ponderosa pine and Douglas fir trees readily accessible to the channel through lateral channel migration and avulsion (Lyon 2015).

Existing riparian vegetation conditions include scattered patches of woody shrubs and immature trees, and large areas of herbaceous vegetation where the floodplain has been cleared and drained for ranching (Lyon 2015). Beavers are uncommon and no longer play a major role in wood delivery to the channel or maintaining diverse off-channel habitats and riparian conditions (Lyon 2015).

Current riparian conditions in the upper GRR, including the project area, are the result of several anthropogenic disturbances that include developing and filling in the floodplain for agriculture, livestock grazing, trapping beaver and eliminating beaver forage, logging and use of splash-dams, and railroad grade and road construction. In the 2015 AQI survey, three riparian transects were surveyed in the project area. The total number of trees per 100m^2 (2 acres) was .3 conifers and 1.8 hardwoods. The trees found most frequently in the riparian zone were 3-15 cm dbh hardwoods. NMFS (1996) defines "functioning appropriately" riparian reserve as "the riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers or includes known refugia for sensitive species (>80% intact) and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/composition >50%." Based on the AQI survey data and professional judgement, the riparian reserve in the project area fits under the "functioning at risk" description: "moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system, or incomplete protection of habitats and refugia for sensitive aquatic species (70-80% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better."

Figure 3. Wide, slow water area showing very little riparian vegetation, predominately sedges and grasses Photo Credit AQI 2015.

3. Summary of Proposed Action

The proposed floodplain and river restoration work would extend for 1.9 river miles (RM) of the mainstem Grande Ronde River (GRR) from approximately RM 144.2 to 146.1, and all side channel and off channel habitat, and would be designed to accelerate the recovery of channel processes, riparian conditions, and fish habitat. To address limiting factors and degraded habitat conditions for fish and aquatic species within the project area, the proposed action would re-establish natural river-floodplain connections and processes. Natural processes within this reach of the GRR that would be restored include multiple channel networks usually created through forcing mechanisms of large wood, ice, beaver, and rock.

Short-term goals of the proposed action include protecting existing critical rearing and holding habitats within the reach and providing additional rearing and holding habitats for salmonids. Long-term goals are to re-establish natural processes to move the existing channel from a stagnant condition to a dynamic channel that interacts with its floodplain. Floodplain connectivity provides habitat for multiple species, flood control, and ice storage benefits. Long-term project goals also include providing cooler water within the reach through attenuation of daily heating with a mature and densely vegetated riparian floodplain, hyporheic flow, and connectivity to seeps and springs.

In order to meet the purpose and need described above, the following actions are proposed within the Bird Track Springs project area:

Channel construction-Channel construction includes realigning the channel of the mainstem Grande Ronde, reactivating and reconnecting relic side channels, constructing new side channels and backfilling portions of existing (old) channel to activate the new alignment and address areas where the channel has over widened. There would be a total of 4.8 affected river miles for channel construction activities. This is equivalent to an approximately 6.9 acre area. This includes 2.12 miles of the mainstem Grande Ronde, .59 miles of the “south channel”, 2.09 miles of various braided side channels, and 0.3 miles of backfilling portions of channels that would no longer be activated with the new channel alignment (see Bird Track All Activities Map). Abandoned reaches of the existing channel would be filled utilizing excavated material from constructed channel segments. Channel construction activities include excavating and relocating approximately 70,632 cubic yards of cut materials and placing approximately 69,027 cubic yards of fill material achieve the correct channel grade. Channel construction activities would relocate portions of the river channel to the south floodplain to encourage it to re-engage with several historic channel swales and pond features. Side channels and alcove features would be enhanced at historic channel meander scars and depressions throughout the floodplain area. In addition, connectivity to spring-fed side channels, wetlands and alcoves would occur to develop suitable summer and winter rearing habitat for juvenile fish and holding water for fish migrating upstream to spawn.

Large wood features (discussed below) would be added throughout the main channel and side channels. Channel features would be re-graded or constructed to alter the existing width and depth to achieve project goals. Constructed channel features would include pools, riffles, and bars made from gravels and cobble sources from local project excavation. Channel features would be constructed to mimic natural river channel development. Floodplain features to include side channels and alcoves would be re-shaped and wood be strategically placed to improve connectivity with the mainstem of the river and to enhance fish cover.

Large wood and boulder structure construction-Approximately 640 strategically placed large wood structures would be constructed within and on the margins of the 4.8 miles of mainstem and side channel alignment to restore hydraulic conditions and enhance fish habitat. About 1,170 trees with rootwads would be utilized for large wood structure construction, 210 trees without rootwads, and 4,000 small trees for racking and pinning material. In addition 5,910 cubic yards of limbs would be used for racking material. Additionally, approximately 540 boulders would be placed to add complexity and channel roughness. Existing boulder-rock weirs that were put in the channel in previous restoration efforts would be removed and boulders would be re-purposed as habitat features or structural ballast.

Large wood structures would be constructed using a combination of whole trees with rootwads intact, cut trees without rootwads, and slash material. Portions of large wood structures would be embedded in the bed and banks of the channel and floodplain to provide stability and integrity during ice buildup and release and to interact with flow to scour pools, store sediment and gravels, and provide cover for fish. At the upstream end of the project area, strategic placement of log structure treatments and graded features would occur to reduce risk of erosion to state highway 244 infrastructure.

Rootwad Harvest-Harvest of whole trees with rootwads intact and cut trees are necessary materials for constructing large wood structures. Tree removal would occur on private land on the Jordan Creek ranch and would follow the Oregon Forest Practices Act guidelines. Harvest would occur on approximately 1,050 acres of private land (Jordan Creek Ranch) to support instream restoration activities. The number of trees and trees with rootwads that would be harvested are described above.

After harvest, trees would either be hauled to the project site and stored in designated staging areas and then transported to their structure construction site locations by off-road dump truck or trees would be flown by helicopter from staging areas on private land close to harvest units on the Jordan Creek Ranch to staging areas along the river depending on site conditions and environmental effects. Excavators would be used for large wood structure construction.

Access trails-Access trails are necessary for heavy equipment, such as excavators and off road dump trucks, to access the channel and floodplain in the project area and transport trees and boulders to structure construction sites. They are also necessary for heaving equipment to access areas where channel realignment is proposed to move cut and fill material. There would be approximately 3.85 miles of temporary access trails across the floodplain and riparian management areas in the project area.

In addition there would be four temporary river crossings that heavy equipment would use to access the north side of the river and floodplain. All areas of disturbance would be rehabilitated with native seed mix and decompacting the soils where appropriate.

Staging and stockpile areas-Approximately 50 areas have been identified to be used as staging/stockpile and equipment storage areas. Together this area is approximately 40.7 acres. Areas were identified that are generally clear of mature vegetation and have the least amount of soil and ground disturbance impacts. Most areas have signs of previous disturbance and land use activities, such as remnant spoils piles. Some clearing of vegetation would occur where necessary. These areas would receive ground disturbance from equipment tracking and mechanical placement of materials.

Existing riparian vegetation, topsoil, shrubs, and trees that require removal would be salvaged and re-used in the floodplain. All areas of disturbance would be rehabilitated with native seed mix and decompacting the soils where appropriate.

Channel isolation/fish salvage-All work areas within the wetted channel would be isolated from the active stream to protect ESA-listed species. Work area isolation would occur in approximately 1.9 miles of existing channel. Project design plans would include all isolation elements including fish salvage and release areas. Salvage operations would follow the ordering and methodologies and conservation measures in BPA's HIP III version 3.0 handbook.

Floodplain Structures Removal –Activities in the floodplain include relocation of corral and feedlot, which is adjacent to the GRR on private property. Over 5 acres is currently cleared and impacted by cows and water impoundment within the RHCA. This whole area would be restored and the existing developed structures would be removed. Additionally, remaining lengths of Mt Emily railroad grade floodplain fill would be removed.

Riparian vegetation planting
Native trees and shrubs would be planted to restore floodplain function, stream bank stability, future large wood recruitment, shade and cover over 4.8 miles channel, streambanks, and adjacent floodplain. In addition, all cleared staging areas, access trails and upland areas in the rootward harvest units would be planted and seeded. Methods include manual seeding and mulching, tree container planting, and mechanical trenching with an excavator or use of an augur to achieve appropriate depths to plant seedlings and cuttings.

4. Effects Analysis

Methods

The direct, indirect, and cumulative effects to fish aquatic resources are based on the estimated beneficial and/or detrimental effects to fish and aquatic resources as a result of proposed activities in both alternatives. Monitoring results of past restoration work in similar types of channels and literature review of similar instream restoration activities were used by Forest Service fisheries biologist to determine short and long term effects of proposed activities. Short term effect refers to effects that occur at the time of implementation of project activities and last through the first flood stage event (for example sediment disturbance that occurs from instream work would be expected to flush out and disperse downstream at the first flood stage event. Long term effects refer to effects lasting from the time of implementation for decades, at a minimum. For example, long term beneficial effects are expected to provide a time buffer for the riparian area in the Bird Track Springs project area to recover and function at its natural, pre disturbance state with large wood recruitment potential, functional floodplain, and a channel with complex habitat for fish and aquatic resources. Table 5 identifies the relative level of effect for fish and aquatic resources.

Table 5. Relative Level of Effects for Fish and Aquatic Resources

Level of Effect	Description
Negligible	No measureable effects resulting from restoration activities to fish and aquatic resources, and no measurable change in fisheries habitats are detectable. Individuals would not be affected, or the action would affect an individual but the change would be so small that it would not be of any measurable or perceptible consequence to the individuals or populations.
Minor	Effects resulting from restoration activities to fish and aquatic resources or other resource areas which indirectly affect fish and/or aquatic resources may occur. Individuals would be affected but the change would be small. Impacts would not be expected to have any long-term effects on species or their habitats, or the natural processes sustaining them. Occasional responses to disturbance by some individuals could be expected, but without interference to reproduction, or other factors affecting population levels.
Moderate	Individuals would be noticeably affected. The effect could have some long-term consequence to individuals or habitat. Fish and/or aquatic organisms are present during particularly vulnerable life-stages, such as spawning, eggs or pre-emergent fry in redds, or migration; or interference with activities necessary for survival can be expected on an occasional basis. Frequent response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels, but no long term population effects are expected.
Major	Populations would be affected with a long-term, vital consequence to the individuals, populations, or habitat. Impacts on species, their habitats, or the natural processes sustaining them would be detectable. Frequent responses to actions by some individuals would be expected, with negative or positive impacts to feeding, reproduction, or other factors resulting in a long-term change in population levels.

Assumptions

All activities in the proposed action would follow Bonneville Power Administration's (BPA) Habitat Improvement Program III version 3.0 (HIP III) General Aquatic Conservation Measures. All General Aquatic Conservation Measures laid out in the HIP III would be implemented and are described within this analysis under the appropriate "action", this includes post-construction conservation measures. Proposed actions for Bird Track Springs are covered under HIP III for River, Stream, Floodplain, and Wetland Restoration. Activities under this category include, improve secondary channel and wetland habitats, set-back or removal of existing berms, dikes, and levees, protect streambanks using bioengineering methods, install habitat-forming natural material instream structure (large wood, boulders, and spawning gravel), riparian vegetation planting, and channel reconstruction. All instream work would occur in compliance with the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (2008).

This effects analyses is based on professional judgment using information provided by forest staff, Aquatic Inventory Survey (AQI) habitat data from Oregon Department of Fish and Wildlife Service (2015), CHaMPs habitat data (2015), relevant references and technical literature review, and subject matter experts. Using technical reports from the published literature that described the most susceptible aspects of species life cycle and/or habitat needs as a guide, quantitative and qualitative information regarding the presence and status of these species and their habitat within the analysis area was assessed.

The analysis area for fish and fish habitat is the existing 1.9 mile mainstem GRR, all relic (currently abandoned) channels and channel realignment areas, floodplain and riparian areas and all wetland and stream courses including private land in rootwad and whole tree harvest units. Because short term effects to fish and aquatic organisms and habitat are unlikely to stop at the downstream boundary of the project area during construction activities, the fish and aquatics effects analysis area includes 300 feet downstream of all in channel or stream bank project related disturbance. This is based on the Department of Environmental Quality Technical Basis for Revising Turbidity Criteria (2005).

Direct effects to fish and aquatic resources are primarily related to sediment input from project actions, which occur at the same time and place as these resources. Direct effects to fish and aquatic organisms also include fish salvage where fish, mussels, and potentially crayfish are handled and moved to a designated location upstream of project activities. Indirect effects are primarily related to sediment and stream temperature impacts which are caused by the action and are later in time or farther removed in distance. Beneficial indirect effects to fish and aquatic habitat include increase in large wood, increase in pool quantity and quality, improved water quality and temperature conditions, and increase in riparian vegetation. Cumulative effects are effects that occur from present and reasonably foreseeable future actions that overlap in time and space that would create a measureable effect when combined with the effects of the Bird Track project.

Key Indicators used to quantitatively display the differences in effects between alternatives on fisheries and aquatic resources are:

- Large Woody Debris:
    - Total Wood – Pieces/mile
    - Key Pieces – Pieces/mile
- Pool Frequency – Number of pools/mile
- Width to Depth Ratio – Rosgen C4 Channel Range

Direct and Indirect Effects on Fisheries and Aquatic Species and Habitat

Fish and aquatic species and habitat

The proposed alternatives were analyzed from the selected indicators to assess potential environmental effects based on existing conditions at the project and watershed scale. The ratings of these indicators show relative change to the baseline (existing condition), and whether the action would have a beneficial, neutral, or negative impacts on the habitat indicator.

Table 6. Alternative 1 and 2 project and watershed scale comparison of selected indicators from the Matrix of Pathway and Indicators (NMFS 1996, USFWS 1998)

Indicator	Baseline (Watershed Scale - 5HUC)			Effects of Proposed Alternatives (Project Scale)		Effects of Propoed Alternatives (Watershed Scale)	
	Properly functioning	Functioning At Risk	Not Properly functioning	No Action	Proposed Action	No Action	Proposed Action
Temperature			X	M	R	M	M
Sediment			X	M	R/d	M	M
Substrate Embeddedness			X	M	R/d	M	M
Large Woody Debris			X	M	R	M	M
Pool frequency and quality			X	M	R	M	M
Large Pools			X	M	R	M	M
Width/Depth Ratio			X	M	R	M	M

Indicator	Baseline (Watershed Scale - 5HUC)			Effects of Proposed Alternatives (Project Scale)		Effects of Propoed Alternatives (Watershed Scale)	
	Properly functioning	Functioning At Risk	Not Properly functioning	No Action	Proposed Action	No Action	Proposed Action
Streambank Condition		X		M	R/d	M	M
Riparian Reserve		X		M	R/d	M	M

(R) Restore=project is likely to have beneficial impacts on habitat indicator
(M) Maintain = project may affect indicator, but impact is neutral
(D) Degrade = project is likely to have a negative impact on the habitat indicator
d = Short-term negative impact associated with construction/implementation phase

Temperature

The following describes the effects of the alternatives in this project on stream temperatures within the analysis area.

Alternative 1 - No Action

Under the No Action Alternative maximum water temperatures would continue to be negatively affected by poor channel stability, high stream width to depth ratios, and riparian and floodplain conditions that are not properly functioning. The existing condition that would persist is an overall temperature trend in the dry season (July through November) that is lethal for fish, particularly in the summer months. Stream temperature as high as 86.9°C have been measured in the Bird Tracks area in July, 2013 (CHaMP 2015). In addition, winter water temperature fluctuations and trends that cause increased discharge or anchor ice development and ice dam creation and break up would continue to make this area inhospitable for juvenile fish by causing forced swimming events when fish need to be conserving energy during periods of low metabolism in the winter (Favrot and Jonasson 2004). The current degraded condition would be maintained.

Alternative 2 - Proposed Action

No direct effects to fish and aquatic species or habitat would result from activities in the proposed action alternative due to temperature. It is anticipated that long term indirect beneficial effects to water temperature would occur beginning after restoration is complete. Temperature would be expected to decrease incrementally in the proposed action alternative as a result of increasing stream bank stabilization, reduced channel overwidening (width to depth ratio), protecting and increasing riparian vegetation and increasing stream shade in the long term. In addition, by reconnecting the channel to its floodplain by restoring morphological processes, floodplain inundation would be expected to occur at more frequent intervals and as the floodplain adjacent to the channel absorbs water and saturates, this water would recharge underlying alluvial aquifers (an area that underlies both the stream channel and riparian zone) which could be an effective buffer against stream channel warming, particularly if the aquifer is recharged predominantly with cold water during the winter and spring months (Poole and Berman 2001), which is what would be expected on the upper GRR. This cold water would then be expected to be discharged to the stream during base flow periods when the highest stream temperatures occur. This would have the potential to buffer extremes in water temperature (Poole and Berman 2001).

Studies have found that a potential benefit of large wood reintroduction is an increase in hyporheic exchange (Boulton, 2007); a process that connects streams with their surrounding aquifers (Sawyer and Cardenas 2012). Restoring complex streambed topography through increasing pool/riffle sequences that drive streambed hyporheic flow (Harvey and Bencala 1993) and installing roughness factors such as large wood and rock that would encourage gravel bar development and would force subsurface and hyporheic flow could have moderate to major benefit beneficial effects to fish and aquatic species and habitat. An enhanced cooling effect of stream temperature would be expected particularly if flood events and aquifer recharge occurs during winter and spring months when the stream temperature is coldest (Poole and Berman 2001). Additionally, McHenry et al. (2007) observed that engineered logjams can create cooler temperature microclimates by the scour pools that develop by these habitat features.

Water temperature buffering could reduce salmonid stress particularly in the summer and winter months; fluctuations in water temperature or permanent shifts in water temperature regimes have likely caused this stream reach to be unusable for native fish species (Quigley and Arbide 1997, Wissmar et al. 1994), particularly at certain life stages. The hyporheic zone is habitat for invertebrates and fish embryos in spawning areas, which are sensitive to temperature, dissolved oxygen, and other biophysical parameters controlled by fluid flow (Poole and Berman 2001). Hyporheic restoration may improve water quality and habitat in both the channel and streambed.

Airborne thermal infrared remote sensing information from Watershed Sciences (Watershed Sciences Inc. 2010) indicated that the Bird Track Springs project reach contains a concentration of cooler water influences and inputs, when compared to the rest of the upper GRR. Project design would incorporate these cooler water influences and improve hydraulic exchange so that the mainstem and side channels would capture connected flow and cool water influence. In addition, designing structures such as beaver dam analogs there would be an increase in habitat that forms behind beaver dams where the water column has vertical temperature stratification and yields stable and highly suitable overwintering habitat for juvenile salmonids (Cunjak 1996).

Addressing the existing over-widened channel by correcting the width to depth ratio, would both decrease the amount of solar radiation because the channel surface area is the area across which heat is exchanged (Poole and Berman 2001) and encourage water to more readily be exchanged laterally or beneath the stream channel with saturated sediments (Findlay 1995).

Activities in and design of the proposed action address factors which markedly influence stream temperature: stream morphology, groundwater influences, and riparian canopy condition (Pool and Berman 2001). The combined effects of restoring these processes would set the trajectory to “restore” the habitat indicator temperature at the reach scale. Moderating temperature in the summer and winter could have moderate to major beneficial effects on fish and aquatic organisms and habitat.

Sediment and Turbidity

Alternative 1-No Action Alternative

The no action alternative would have no impact on sediment input and substrate embeddedness, current conditions would be “maintained.” Lateral stream migration and accelerated bank erosion would continue to contribute to the sediment load in the GRR.

Fine sediment in the Grande Ronde River mainstem has been identified as being excessive from Five Points Creek confluence to the Headwaters, this includes the project area (UGR TDML 2000).

Alternative 2-Proposed Action Alternative

Activities in the proposed action that have the potential to result in short term direct increases in sediment and associated turbidity to stream channels include excavation in existing stream channels and banks to “seat” trees, rootwads, and boulders, digging trenches in banks to plant cuttings, and “cutting” new channels in the floodplain and RHCA associated with channel realignment or constructing habitat features such as alcoves and beaver analogs. There may also be indirect input of sediment into stream channels from ground disturbance in the floodplain and stream banks associated with heavy equipment tracking on temporary access trails and mobilizing material to the channels, the four sites where heavy equipment would cross the GRR to access the north side of the channel, and tree and rootwad harvest. The long term effects of proposed project activities on sediment and turbidity would be indirect beneficial effects to fish and aquatic species and habitat by restoring stream processes and stabilizing areas of lateral migration and accelerated bank erosion.

Proposed construction of channel and habitat structures would cause short term increases in sediment delivery and associated turbidity to the GRR in the project area and up to 300 feet downstream that could exceed Oregon turbidity standards. Excavators would work in the channel and from the banks to dig pools, construct habitat structures, beaver analogs, and alcoves, seat trees, trees with rootwads and boulders into the stream bed and banks for large wood structure construction, and excavate new or realigned channels. Work areas would be isolated, fish would be removed, and channel would be dewatered. However, it is likely that excavation work would hit ground water even with all effort taken to “dewater” the construction area. This ground water could seep downstream and cause plumes of sediment and an increase in turbidity during construction. These activities would likely cause short term direct effects to water quality, which could cause short term, direct effects to fish and aquatic habitat and short term indirect effects to fish and aquatic species

In addition, when water is “introduced” or “reintroduced” to the channel after construction is complete, there would be local sediment flushing and increased turbidity from the disturbance in the channel and banks. Turbidity generated from these sediment pulses would be expected occur in the immediate vicinity of the structures and up to 300 feet downstream. The duration of elevated turbidity levels could last as long as equipment is working in the channel, stream banks, or digging or trenching to plant riparian vegetation. Even in a dewatered channel, excavation may reach ground water, which could connect to downstream flows and elevate turbidity levels. See description below for turbidity monitoring and mitigation.

Heavy equipment tracking on access trails to the channel and tracking over banks to enter the channel at the four designated locations would compact the soil and could cause rutting and rilling during run off events. See the soil and hydrology effects analysis for effects to soils and hydrologic function from floodplain ground disturbing activities. These activities would be expected to have potential short term effects to water quality, but would have negligible effects to fish and aquatic species and habitat because in water work areas would be isolated with blocknets to keep fish and aquatic species away from disturbance and the construction area would be dewatered, see Project Design Criteria and Mitigation Measures related to fish, fish habitat and water quality. All access trails and equipment access areas and tracking on the floodplain would be decompacted, planted and rehabilitated, which would minimize any long term effects to fish and aquatic habitat.

Trenching is a method that may be used in some locations over 4.8 miles of streambank and RHCA in the project area for riparian planting. In order to dig far enough down to ensure roots reach the water table, ground water disturbance may occur, which could input sediment into fish and aquatic habitat. Effect would be short term, and a buffer between the area of trenching and fish and aquatic habitat may filter out sediment before it enters the channel.

Methods to harvest trees with rootwads intact include use of a track-mounted (200 series or larger) excavator. The excavator would dig a shallow, 2-3 feet trench around approximately half of the outer diameter of the root wad. The excavator bucket would then push the tree over, avoiding damage to the rootwad and bole. The hole that remains from extraction would be filled with soil and graded to match the adjacent ground surface. Depending of the size of the tree, the top is cut and the tree and intact root wad would be loaded on an off-road dump truck or log truck, and then transported to a staging area where the trees are sorted into various size categories. From the staging areas within the project area the trees are moved to individual large wood sites using off-road dump trucks and placed within the stream or habitat structure using a track-mounted excavator. Disturbed wood harvest sites, access roads, and staging areas are rehabilitated by planting a native grass seed mix. All stream channels and wetland areas in harvest units would be protected using PACFISH/INFISH no activity buffers. There are no Category 1 Fish Bearing streams in any harvest units. Perennial non-fish bearing streams would have a minimum no activity buffer of 150 feet on each side of the stream channel and intermittent channels and wetlands (< 1 acre) would have a minimum 100 feet no activity buffer. Implementing these buffers would prevent any potential indirect effects to fish and aquatic species and habitat.

Although there would be some short term adverse effect to water quality, short term effects to fish would be minimized since work would occur within the ODFW in water work window, when stream flows are generally low and conditions are dry and fish species are in their least vulnerable life stages. Construction areas would be isolated and fish and mollusks such as mussels, would be removed and placed at a location upstream of work area, to avoid direct effects from increased sediment and turbidity.

Erosion control measures discussed in Project Design Criteria and Mitigation Measures (Appendix A) would be followed to minimize effects of construction. The HIP III Turbidity Monitoring Protocol would be implemented during in channel disturbance. The HIP III Turbidity Monitoring Protocol involves measuring suspended sediment to ensure that there are not exceedances in turbidity levels. A site would be sampled 100 feet upstream of project activities and 100 feet downstream; these turbidity levels would be measured and compared every 2 hours. If the difference in turbidity is over 10% at the downstream site, the activity would stop until the turbidity levels return to back ground levels.

Water quality monitoring and observations would be recorded to ensure that in-water work is not degrading water quality. Clean Water Act section 401 water quality certification provisions provided by the Oregon Department of Environmental Quality would be followed. If allowable water quality impacts defined by Oregon CWA section 401 water quality certification or HIP III Turbidity Monitoring Protocol are exceeded, project operations would stop. The HIP III rewatering plan, which involves staged rewatering by introducing streamflow into a new excavated channel or side channel slowly, would be implemented to minimize short term increases in sediment and turbidity and associated effects to fish and aquatic organisms. The turbidity monitoring protocol would be followed during this process also. Adverse effects to fish would be short term and would occur during construction or post construction as the channel is rewatered and connected to downstream flow. Sediment and turbidity increase would not be expected to occur beyond 300 feet downstream of construction.

Large wood structures installed into the banks are expected to dramatically increase bank stability and reduce chronic sediment inputs into the stream from eroding banks after installation. Monitoring of 1996 restoration efforts in Layout Creek, on the Gifford Pinchot National Forest demonstrated that in-stream log structure increased bank stability from 60% stable to 80% stable and reduced the annual sediment load in treated areas from 330 cubic yards to less than 30 within four years (USDA 2000). Direct mortality of aquatic macro invertebrates within the project area is anticipated. This impact would be brief (12 hours) after disturbance and would be limited to the treatment reach and approximately 1 mile downstream. Based on research by Novotny and Faler (1982), recolonization of aquatic invertebrates from upriver reaches could occur rapidly due to species dispersal from in river drift. Gersich and Brusven (1981) estimated that full aquatic insect colonization of rock substrates within disturbed areas would take 47 days.

The short term direct and indirect effects of the project actions on sediment and turbidity and substrate embeddedness are expected to move the baseline condition toward a “degrade” rating for the short term (lasting through the length of construction activities). Large wood complexes are expected to retain, sort, and route some amount of construction related sediment within the project reach, however, short term effects of sediment retention could cause elevated substrate embeddedness, affecting the living space for macroinvertebrates and armoring potential spawning gravels. Sediment retention would likely not be observable in the GRR downstream of construction work. Studies have shown that large wood complexes not only catch sediment but the size of sediment that is retained increases spawning habitat for salmonids (McHenry et al. 2007).

Water quality at a local scale is expected to improve in the long term due to a decrease in erosion and sediment input into the channel. As the new channel alignment and complexity, including channel braids and side channels, capture water at high flows and as the wood structures force water laterally onto the floodplain, existing stream banks would receive less sheer stress and would have bank protecting materials such as large wood complexes and eventually mature riparian vegetation to increase stream bank stability.

Rehabilitation of eroding banks would provide long term benefits to fish and aquatic habitat by reducing fine sediment inputs for the long term, at the local, project area, scale. Therefore the long term and indirect effects to fish and aquatic organisms and habitat in the project area on these indicators are considered “restore.”

Large Woody Debris

The physical and biological effects of large woody debris (LWD) on stream ecosystems has been widely studied, and the effects of streamside logging practices on stream ecosystems in the North American Pacific Northwest of are well understood (Hartman et al 1996). For instance, LWD has been shown to decrease stream bank erosion, increase storage and routing of sediment and organic debris (Smith et al. 1993, Wallace et al. 1995, Gomi et al. 2002, Hassan and Woodsmith 2003), modify and maintain channel geomorphology (Murphy and Meehan 1991, Nakamura and Swanson 1993), alter flows (Bryant 1983, Everest and Meehan 1981, Harmon et al. 1986), retain organic and dissolved materials important to primary producers (Bilby and Likens 1980, Wallace et al. 1995), and lead to increased densities of fish (Roni and Quinn 2001).

Studies have also shown that logging in riparian areas can decrease instream LWD recruitment, and removal of LWD from streams can increase the export of sediment bedload and organic material from stream systems (Dolloff 1986, Smith et al. 1995, Hedin et al. 1988).

Alternative 1 - No Action

The no action alternative would have no immediate impact on the volume of in-stream large wood. The current condition is “not properly functioning” (Table 2). Current degraded conditions would be “maintained” (Table 2). Although currently there are limited sources of wood recruitment since riparian areas and streamside vegetation has been degraded by historical land management in the project area and upstream in the Upper Grande Ronde subbasin, it is expected that some large wood recruitment would occur and the volume of instream woody debris would slowly recover in the long term (50-100 years).

Wood that currently exists in the channel would continue to decay and mobilize with ice buildup and release or flood events. The current lack of large wood within the project area would continue to inhibit juvenile salmonid rearing habitat, cover and protection for fish and other aquatic organisms, habitat diversity, and hydrologic and floodplain function.

Alternative 2 - Proposed Action

The proposed action would have major short and long term direct and indirect beneficial effects to fish and aquatic habitat and moderate to major indirect beneficial effects to fish and aquatic species. Up to 1380 trees, the majority with rootwads attached, would be incorporated into 640 habitat forming large wood structures over 4.8 miles of channel in the project area. In addition, smaller trees and limbs used to simulate "racking" material would be incorporated into large wood habitat structures. Benefits to adult and juvenile salmonids and habitat from the addition of large wood include increased channel complexity, increased cover for protection, increased pool frequency and quality, improved off channel habitat, increased frequency of inundation of water on the floodplain and retention of organic materials.

Table 7. Alternative 1 and 2 LWD in BTS project area and adjacent reaches

Large Wood Indicators	PFC Levels	Alternatives	
	Properly Functioning Levels	Alternative 1	Alternative 2
Total Wood (pieces/mile)	N/A	22*	499
Key Pieces (pieces/mile)	>20	9*	287.5

*AQI 2015 numbers

Pieces of LWD would increase dramatically in Alternative 2 (Table 7). The RMO of >20 pieces per mile of "key" sized LWD would be met. The reach would still not be considered "properly functioning" until the riparian area recovered to the point where an adequate source of future woody debris available for recruitment was present. Quantities of LWD in Alternative 1 and 2 shown in Table X include wood counts in side channels. The pieces of LWD per mile in Alternative 1 includes AQI survey length immediately downstream of the project area reach, "Longley Meadows."

LWD has been shown to play a crucial role in the survival and abundance of juvenile salmon. In winter months juvenile coho and steelhead have been shown to occupy microhabitats within 1 meter of instream LWD (Bustard and Narver 1975). In contrast, experimental LWD removals from a southeastern Alaska stream lead to a decline in the abundance of age 1 coho and dolly varden (Bryant 1982, Dolloff 1986).

In summary, adverse effects to fish and aquatic organisms from large wood addition including structure construction (discussed in Sediment and Turbidity effects) are expected to be minor and short in duration. Direct and indirect effects to fish and aquatic habitat from large wood addition are expected to be moderate to major beneficial effects. The overall effect of the proposed action on this indicator is classified as "restore," (Table 2) indicating the project would have beneficial impacts from increasing large wood levels.

Pool Frequency, Quality, and Large Pools

Pools provide refuge and cover to fish and aquatic organisms, for protection from predators as well as important living space. The following describes the effects of each alternative on pool frequency, quality and size.

Alternative 1 - No Action

The no action alternative would have no impact on pool frequency, quality or large pools. Previous restoration efforts, which used rock dikes and boulder weirs and some buried root wads sticking out of the bank to serve as rip rap would remain in place. Many of these structures were ineffective in restoring habitat, however some small pools are associated with these structures. The GRR in the project area is considered “not properly functioning” (Table 6) for the habitat indicators pool frequency and quality and large pools. Current degraded conditions would be “maintained” (Table 6).

Pool frequency, quality, and large pools may slowly improve in the long term if and when mature riparian vegetation and large wood recruitment return to pre-disturbance levels.

Alternative 2 - Proposed Action

Some large wood structures in the proposed action alternative are designed with the objective to scour pools and decrease width-to-depth ratios. Pools would be constructed at some locations and existing pools would be enhanced. Therefore, the direct and indirect effects of the proposed action on this indicator is classified as “restore.” Effects from implementing the construction that includes excavation of channel materials to construct large wood structures or create pools is discussed under “Sediment and Turbidity” above.

Table 8. Alternative 1 and 2 pool frequency in BTS project area

Indicators	PFC Levels	Reach	
	Properly Functioning Levels	Alternative 1	Alternative 2
Pools/mile	26	12.8	25 to 30

The increase in wood forced large scour pools would have the potential to directly and indirectly benefit all species and life stages of fish by providing low velocity resting habitat, cover from predators and depth that could provide cooler temperatures through vertical stratification in the summer and more stable temperatures in the winter (particularly low velocity pools with warmer groundwater and/or subsurface river water) when surface ice occurs. In addition, the increase in large pool habitat would indirectly increase foraging efficiency for juvenile and resident fish at certain life stages. Alternative 2, approximately 40 major pools would be constructed in the main stem and larger side channels. Many additional pools would be constructed in the smaller side channels and alcove features. There would be approximately 25 to 30 pools per mile in Alternative 2.

Through a biotelemetry study in the Upper GRR, Favrot and Jonasson (2016) found that overwintering Chinook parr overwhelmingly occupied near bank pools exhibiting depths exceeding 1 meter, bottom velocities ranging from 0.0 to 0.1 m/s, cobble and boulder substrates, cover consisting of large woody debris, and undercut banks. This was determined to be the most suitable habitat for overwintering parr. Favrot and Jonasson (2016) advise habitat restoration efforts on the upper GRR to focus on stabilizing overwintering conditions, such as side-channels, alcoves, backwaters, and beaver ponds) this is especially important during meteorological conditions such as rain on snow events and ice dam break up that cause flooding. Increased discharge and velocity cause additional stress to overwintering juvenile salmonids during periods when their metabolic rates are depressed. Changes in habitat, including increased velocity, can force salmonids into forced swimming events that can have detrimental effects to fish, causing size selective morality due to exhaustion or elevated predation vulnerability (Simpkins et al. 2004, Brown et al. 2011).

Increasing pool frequency, pool quality and large pools in the 4.8 miles of existing and realigned channel would have major long term, beneficial direct and indirect effects on fish and aquatic habitat in the project area. Restoring this type of habitat would also have major beneficial indirect effects to fish and aquatic species. Short term adverse effects associated with channel construction and excavation of channel bed material are discussed in the Sediment and Turbidity discussion above.

Streambank Condition

Alternative 1 - No Action

The no action alternative would have no impact on this indicator, current conditions, which are "functioning at risk" would be "maintained." Under the no action alternative lateral stream migration and accelerated bank erosion would continue to contribute to the sediment load of the GRR. At the downstream most extent of the project area on the boarder of Bear Creek Ranch on the mainstem channel, the headcut that has begun just downstream of the split flow on river right could progress upstream and the majority of the Grande Ronde would occupy this new channel. Over the long term (50-200+ years), as riparian forests begin to recover, and the volume of in-stream large wood debris increases, streambank conditions and sediment inputs are expected to slowly improve.

Alternative 2 - Proposed Action

As previously discussed in Sediment, Turbidity, and Substrate Embeddedness section of this assessment, bank stability is expected to be dramatically increased and, thus, the short term and long term direct effects to fish and aquatic habitat of the proposed action on this indicator are classified as "restore." Benefits to fish and aquatic species would be indirect in nature and associated with stabilizing banks and bank erosion using large wood and riparian planting, adjusting width to depth ratio, and constructing bank protection large wood complexes. In addition, creating a more natural channel(s) with braids and complexity would be expected to reduce the sheer stress on erosional banks during run off and high flow events. In addition addressing ice forming dam build up and break up effected areas would reduce the impact on eroding banks during such events.

Width/Depth Ratio

Alternative 1 - No Action

The existing width to depth ratio in this section of the mainstem GRR, characterized by an extremely over widened channel, would remain the same due to lack of channel roughness found in large wood, resistant bank material, or adequate riparian vegetation. The lack of connectivity with the floodplain would continue to reduce the storage capacity and slow release of water saturated in the floodplain throughout the summer months. The no action alternative would "maintain" a degraded condition for this indicator (Table 2).

Alternative 2 - Proposed Action

Implementation of the proposed action would have immediate direct effects on fish and aquatic habitat through decreasing width to depth ratio. Realigning the mainstem GRR and increasing complexity, braiding, off channel habitat, narrowing cross-sectional area to force scour pools, would restore channel morphology. Large wood structures and increased bank stability would provide a more defined river channel with greater lateral resistance, which would indirectly decrease width to depth rations in the short term. These actions would create deeper, more defined pools and riffle sections with adequate gravels and improved aeration, lateral sediment storage features, and floodplain development. Analysis of previous restoration efforts suggests that width-to-depth ratios may be reduced by one-third or more in the year following structure installation (USDA 1997). This immediate enhancement of channel morphology would foster recovery of riparian vegetation and improvement of stable riffle and pool development. Reduction in width-to-depth ratios and increased stream shade in the long term is also expected to incrementally decrease water temperature (see Temperature analysis above). Consequently, the indirect effects of the proposed action alternative on this indictor are classified as "restore."

Table 9. Alternative 1 and 2 Main stem width to depth ratio in BTS project area

Indicators	Rosgen C4 Channel Range (PFC)	Alternative 1	Alternative 2 Main stem	Alternative 2 Side channels
Width to Depth Ratio	13.5-28.7	39.2	24 to 25	12 to 13

Riparian Habitat Conservation Areas

Alternative 1 - No Action

The no action alternative would have no impact on riparian forests over the short- or mid-term (0-10 years). Current conditions, "functioning at risk" would be "maintained." Riparian vegetation would likely grow at current rates, with potential improvement in forest structure and diversity as trees become more mature. With the existing cottonwood trees, a seed source exists and there are some areas where young trees are thriving. It would be expected that in 50-100+ years root networks would help stabilize soils, canopy cover would more sufficiently shade streams, and sources of large wood recruitment would exist. And because there is no grazing on the public land portion of this project, and no harvest of trees within 300 feet of the main stem or existing side channels, riparian vegetation would be expected to continue to improve if conditions such as soil moisture, chemistry, and nutrients are suitable for existing species.

Alternative 2 - Proposed Action

During the construction phase along the riverbank some trees may be taken down as excavators access treatment site and realignment areas and dig the log structures into the bank. These trees would be incorporated into the constructed log complexes. There would be 3.8 miles of temporary roads built and 40.7 acres of staging, storage and stockpile areas in the floodplain with some amount of clearing of existing vegetation. Removal of existing vegetation would cause some short term effect to the riparian area, floodplain and potentially stream banks and stream channel. Direct effects of loss of vegetation from stream banks would be erosion during runoff events. This would be minimize by implementation of the erosion control plan. Indirect effects to fish and aquatic habitat and species from removal of some streamside vegetation is loss in shade and cover. No large trees would be cut and removed from the riparian area. New or existing side channels would be designed to maintain riparian wood for shade and future large wood recruitment as much as possible. These disturbances would be minor and short term and are expected to revegetate in one year with all of the additional plantings, although mature riparian vegetation would be a long term process for recovery.

All decommissioned access trails and temporary staging areas would be seeded using a native erosion control mix and replanted after soil is decompacted as outlined in Project Design Criteria and Mitigation Measures. In addition to all disturbed areas being seeded and replanted, project activities include large scale riparian planting. This would entail using various methods….to plant seedlings and cuttings on stream banks, on the floodplain, and on channel islands and gravel bars in the channel. Seedlings and cuttings would be planted over some or all of the 4.8 miles of stream bank and floodplain associated with channel restoration. Short term effects associated with riparian vegetation planting include mechanical trenching to reach groundwater for trees and shrub seedlings and cuttings to thrive. Potential short term effects to water quality from increased sediment and turbidity are discussed in the Sediment and Turbidity section of this analysis.

Short term indirect effects to fish and aquatic species and habitat would occur from ground disturbance resulting in increased turbidity during excavation within the channel as discussed in the Sediment and Turbidity analysis above. In the long term (30+ years), stabilization of the floodplain and accelerated recovery of riparian areas would indirectly benefit fish and aquatic habitat and species by providing stream shade, banks stability and future recruitment potential of large woody debris. In addition approximately 4.7 acres adjacent to the GRR on the Jordan Creek Range, which is currently a corral structure and feedlot with an impoundment for water right next to the river, would be moved and rehabilitated. This would have moderate to major beneficial effects to the RHCA, including vegetation recovery, floodplain function, water quality, and soil rehabilitation. This structure and feedlot would be moved to an area outside of the RHCA.

There would be a short term "degrade" to Riparian Habitat Conservation Areas during the construction phase of the proposed action, but the project effects would have a long term "restore" effect to the Riparian Reserve.

5. Aquatic Management Indicator Species

U. S. Forest Service (USFS) regulations require site-specific analysis of the effects of actions on species identified as Management Indicator Species in the Wallowa-Whitman Forest Land and Resource Management Plans (LRMP, 1990) as amended. This analysis was conducted for the Birdtrack Springs Fish Habitat Enhancement Project and meets USFS regulations, policies and objectives for MIS management.

The Wallowa-Whitman National Forest Land and Resource Management Plan (1990) identifies the following fish species as management indicator species: redband /rainbow trout and steelhead. These species were selected as they were considered to be good indicators of the maintenance and quality of instream habitats. These habitats were identified as high quality water and fishery habitat.

The National Forest Management Act regulations require that "fish and wildlife habitat be managed to maintain viable populations of existing …species in the planning area." To ensure that these viable populations are maintained, the Pacific Northwest Region of the Forest Service has identified management requirements for a number species within the region. These Management Indicator Species are emphasized either because of their status under ESA or because their populations can be used as an indicator of the health of a specific type of habitat (USDA 1990).

Riparian areas occur at the margins of standing and flowing water, including intermittent stream channels, ephemeral ponds, and wetlands and extend out to include the floodplain and associated groundwater and vegetation. The aquatic MIS were selected to indicate healthy stream and riparian ecosystems across the landscape. Attributes of a healthy aquatic ecosystem includes: cold and clean water, clean and appropriate sized channel substrates, stable streambanks; healthy, mature streamside vegetation, complex channel habitat created by large wood, cobles, boulders, streamside vegetation, and undercut banks, deep pools, and no artificial barriers obstructing movement. Healthy riparian areas maintain adequate temperature regulation, nutrient cycles, natural erosion rates, and provide for instream wood recruitment.

The length of the upper GRR through the project area, 1.9 miles, is documented habitat for redband and steelhead trout.

Steelhead – The viability criteria defined by the Interior Columbia Technical Review Team (ICRT) reflects the hierarchical structure of salmonid populations and species. The criteria describe the biological characteristics for the species, Major Population Groups (MPGs) and independent populations that are consistent with a high probability of long-term persistence. The ICTRT used the viability criteria to assess the extinction risk based on four different viable salmonid population (VSP) parameters: abundance, productivity, spatial structure and diversity. The ICTRT also assessed the "gap" between the populations' current status and the desired status for delisting based on the viability criteria. The ICTRT used the information from the population –level assessments to evaluate viability at the next hierarchical level, the MPG. All Steelhead MPGs need to meet the ICTRTs viability criteria for the ESU to be rated viable.

The Lower Grande Ronde population of the Grande Ronde MPG currently does not meet the minimum abundance and productivity values that represent levels needed to achieve a viable population (95% probability of persistence over 100 years for the population). The current status of the Lower Grande Ronde River Steelhead population for risk of extinction is Low to Moderate with the desired status of Low or Very Low Risk.

The Wallowa-Whitman National Forest is utilizing this viability assessment for Snake River Steelhead populations for the purposes of MIS assessment.

Redband/Rainbow Trout–

Redband trout habitat requirements are similar to that of juvenile steelhead. Redband trout are sensitive to changes in water quality and habitat. Adult redband trout are generally associated with pool habitat, although other life stages require a wide array of habitats for rearing, hiding, feeding and resting. Pool habitat is an important refugia during low water periods. An increase in sediment in the stream channel lowers spawning success and reduces the quality and quantity of pool habitat. Spawning takes place from March through May. Redband redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailout area of pools. Eggs incubate during the spring and emergence occurs from June through July depending on water temperatures. Redband trout may reside in their natal stream or may migrate to other streams within a watershed to rear.

Other important habitat features include healthy riparian vegetation, undercut banks and large wood debris. The Wallowa-Whitman National Forest is utilizing this fish/habitat relationship to provide the basis for assessment of redband trout populations for the purposes of MIS assessment.

In the absence of redband trout population trend data, the Wallowa-Whitman National Forest has measured key habitat variables, and then assessed changes expected to occur as a result of project activities. This MIS analysis assumes that activities that maintain and improve aquatic/riparian habitat would provide for resident fish population viability on Wallowa-Whitman National Forest lands.

Existing Conditions

The area of analysis for USFS MIS for the proposed action is miles of steelhead and redband/rainbow trout habitat in the project area, 1.9 miles. There is approximately 990 miles of steelhead habitat and over 1,310 miles of redband/rainbow trout habitat on the Wallowa-Whitman National Forest. The amount of habitat in the project area represents a fraction of the overall miles of habitat for the entire forest.

Overall habitat conditions for the Upper Grande Ronde Subbasin, and specifically the reach of the GRR in the project area, confirmed by recent ODFW (CHaMPs and AQI) habitat data, are rated as not properly functioning for temperature, sediment, substrate embeddedness, large woody debris, pool frequency and quality, large pools and width to depth ratio. The current conditions for streambank condition and riparian reserves are functioning at risk (Table 2). These surveys collect data on stream channel and habitat elements, riparian vegetation and fish. Data collected from these surveys are then rated using habitat indicator benchmarks developed by the NMFS (1996) and USFWS (1998).

Direct and Indirect Effects to MIS

There is potential for short term direct effects to MIS fish and fish habitat from the implementation of the proposed action. Direct effects are fish salvage, which would trap, net or electroshock fish to capture them and relocate them to an adequate area upstream of isolated areas, which would be dewatered. There would be short term direct effects to water quality from channel work including habitat structure construction, channel realignment including streambed excavation, wood and boulder placement, and digging in streambanks for riparian vegetation planting. These direct effects to water quality could have indirect effects to MIS fish downstream of the project area, if suspended sediment and turbidity is carried into an area where fish are present (for more information see direct and indirect effects to Sediment and Turbidity in the Effects Analysis). Project design would monitor turbidity and water quality, utilize erosion control measures and follow all HIP III Construction and Post Construction Conservation Measures. This would minimize direct and indirect effects to fish.

Long term benefits to all habitat indicators would have moderate to major beneficial effects to redband/rainbow trout and steelhead. Improved habitat, increased channel complexity, restored floodplain function, riparian vegetation planting and restoration would all benefit habitat in this reach of the GRR.

6. Project Effects on Riparian Management Objectives

Landscape-scale interim RMOs describing good habitat for anadromous fish were developed using stream inventory data for pool frequency, large woody debris, bank stability, and width to depth ratio. State water quality standards were used to define favorable water temperatures. All of the described features may not occur in a specific segment of stream within a watershed, but all generally should occur at the watershed scale for stream systems of moderate to large size (3^{rd} to 7^{th} order).

RMOs are as follows:

Pool Frequency: (varies by wetted width)

Wetted width in feet:	10	20	25	50	75	100	125	150
Number of pools per mile:	96	56	47	26	23	18	14	12

Water Temperature: Compliance with state water quality standards, or maximum < 68F.
Large Woody debris: > 20 pieces per mile; >12 inches diameter; 35 foot length
Bank Stability: >90 percent stable
Width/Depth Ratio: <10, mean wetted width divided by mean depth

All of the RMOs would be trending toward "restored" in the long term with the implementation of the proposed action (see Table 2).

Cumulative Effects

Potential cumulative effects are analyzed by considering the proposed activities in the context of present and reasonably foreseeable future actions. Reasonably foreseeable future action is defined as within the next five years. Appendix D of the EA summarizes the present and reasonably foreseeable management activities that would occur in the cumulative effects analysis area, and summarizes the determination of cumulative effects.

The logical area for effects to occur that could have a cumulative impact would be in the three subwatersheds that partially overlap with the project area; Coleman Ridge-Grande Ronde River (HUC 170601040307), Jordan Creek subwatershed (HUC 170601040303), and Lower Beaver Creek (HUC 170601040302). Because the project area and effects analysis area is small, 6,301, activities that occur within portions of these subwatersheds that are not in the vicinity of the project area are less likely to add to a cumulative effect.

Alternative 1 - No Action

The detrimental effects from no action are similar to indirect effects of lack of recovery from past degrading actions rather than cumulative effect from no action. The proposed project area, like most of the upper GRR has been highly disturbed by the historic logging, grazing, road building, mining and beaver trapping. By not improving channel conditions in this alternative, the proposed project area would continue to maintain a degraded channel condition and degraded habitat for fish and aquatic species.

Past timber harvest, splash dams, railroad grade, road building, converting floodplain into agricultural uses, and heavy grazing have been the primary management activities that contribute to cumulative effects and degradation of fish and aquatic habitat. Ice buildup and flooding has also likely slowed the rate of recovery of the upper GRR through the Bird Track Springs area. Restoration efforts in the upper watershed have included road decommissioning, instream large wood placement, riparian plating. Wood and boulder weirs were added in past restoration efforts to the GRR and side channels in the past.

Future timber harvest and road construction on private lands within the subwatersheds could result in incremental increases in fine sediment which could be delivered to fishbearing streams, particularly if these activities occur within RHCAs. Sediment production from future vegetation management projects on public lands is not expected to accumulate to measureable levels, above background, because riparian protection measures would be incorporated into all harvest unit designs on public land.

Alternative 2 - Proposed Action

Past timber harvest, splash dams, railroad grade, road building, converting floodplain into agricultural uses, and heavy grazing have been the primary management activities that contribute to cumulative effects and degradation of fish and aquatic habitat. Ice buildup and flooding has also likely slowed the rate of recovery of the upper GRR through the Bird Track Springs area. Restoration efforts in the upper watershed have included road decommissioning, instream large wood placement, riparian plating. Wood and boulder weirs were added in past restoration efforts to the GRR and side channels in the past.

Fine sediment would be introduced into the GRR channel effecting the site and up to 300 feet downstream of the site during construction activities. This would cause short term effects to water quality and indirect effects to fish and aquatic habitat and individuals. Turbidity levels are expected to return to background levels within hours of equipment finishing. Long term effects of the proposed action would improve conditions to habitat.

Other activities in the project area or in within subwatersheds that cause sediment could have a cumulative effect, particularly if they occur during the construction and operating window for the proposed action (since increased sediment and turbidity would be short in duration). Sediment entering the stream from OHV use and user built trail construction could impact riparian habitat, streambanks and could introduce sediment into the channels. Because the Bird Track Springs area receives recreation use, due to adjacent recreation facilities, these activities could cause additional sediment to the channel, which would result in a short term cumulative effect on water quality in the project area and downstream of the project area.

It is not known whether road building or timber harvest is planned on private lands in subwatersheds that overlap with the project area. If these activities occur at the same time as implementation of the proposed action, an incremental increase in fine sediment could be delivered to the GRR through tributaries on private land.

Future restoration activities within these subwatersheds or in the Upper Grande Ronde Subbasin that would address prime spawning habitat for Chinook or cold water refute found in tributaries to the GRR that benefit rearing juvenile fish, would have overall beneficial cumulative effects to fish and aquatic species that occupy these habitats

7. Determination of Effect to Listed Fish, Fish Habitat and Sensitive Fish Species

ESA Listed Fish Species

ESA Federally Listed Threatened Fish

Consultation on effects to federally listed threatened fish in the project area will be completed under Bonneville Power Administration's Habitat Improvement Program (HIP III). Requirements in Biological Opinions issued from USFWS and NMFS will be followed for all project activities.

Alternative 1 - No Action

The no Action alternative would leave the proposed project area stream channel conditions in their current state. By not improving stream channel conditions the proposed project area would continue to maintain degraded stream habitat and riparian area for ESA listed fish.

Alternative 2 - Proposed Action

Snake River spring/summer Chinook, Snake River steelhead, and Columbia River bull trout have been listed as threatened by National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS). All three species occur within the project area; the project area is considered designated critical habitat.

The preliminary ESA effects determination for the proposed action for all three ESA listed fish is "Likely to Adversely Affect" due to short term disturbance, sedimentation, and turbidity related to in-stream activities. In addition fish salvage (or removal) would occur where instream work areas are isolated and dewatered. This process would involve handling of fish and may involve use of an electro shocker following NMFS (2000) electrofishing guidelines. Operation would be led by an experienced fisheries biologist and all procedures would be followed so that pulse width and voltage would only be increased to levels where fish are immobilized, however, there is still some risk that injury and/or mortality can occur using this method for fish removal. Fish would be placed in buckets and moved to a location upstream of the project area. Over the mid to long term, the project is expected to substantially improve habitat conditions and promote the recover for all three species.

Table 10. Proposed Action Federally Listed Threatened Fish Determinations

Species	No Action	Proposed Action
Snake River spring/summer Chinook	No Effect	Likely to Adversely Affect
Snake River steelhead	No Effect	Likely to Adversely Affect
Columbia River bull trout	No Effect	Likely to Adversely Affect
Designated Critical Habitat	No Effect	Likely to Adversely Affect

Region 6 Sensitive Fish and Aquatic Species

This aquatic specialist report satisfies requirements of Forest Service Manual 2672.4 requiring the Forest Service to review all planned, funded, executed or permitted programs and activities for possible effects on proposed, endangered, threatened or sensitive species by completing a Biological Evaluation (BE). The Region 6 Regional Forester Special Status Species List was updated in July 2015. The BE process is intended to review the Bird Track Springs Fish Habitat Enhancement Project in sufficient detail to determine effects of alternatives on species in this evaluation and ensure proposed management actions would not:

- likely jeopardize the continued existence, or cause adverse modification of habitat, for a species that is proposed (P) or listed as endangered (E) or threatened (T) by the USDI Fish and Wildlife Service or NOAA National Marine Fisheries Service; or
- contribute to the loss of viability for species listed as sensitive (S) by USDA Forest Service, Region 6, or any native or desired, non-native species; nor cause any species to move toward federal listing (FSM 2672.4).

The following sources were used during the prefield review phase to determine the presence or absence of aquatic sensitive species in the effects area for the Bird Track Springs Fish Habitat Enhancement Project:

- Wallowa-Whitman N.F. GIS database
- Regional Forester’s (R6) sensitive animal list (July, 13, 2015)
- ODFW stream survey and fish survey reports
- Oregon Native Fish Status Report (2005)

There are six sensitive fish and aquatic species on the Forest Service Region 6 Sensitive Species List that occur or are suspected to occur within the planning area and may be potentially affected by project activities (see Table 4). Effects determination for fish and aquatic species that occur in the project area or within 300 feet downstream of the project area or are suspected to occur in the project area based on habitat association is “May Impact Individuals or Habitat, But will not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.” The proposed project would have beneficial long-term effects on the habitat of all listed species.

Table 11. Region 6 Fish and Aquatic Sensitive Species

Species	Proposed Action					
	Status	Documented in Analysis Area	No Effect	MIIH	WIIH	Beneficial Impact
Redband Trout (*Oncorhynchus mykiss*)	R6S, MIS	Yes		X		X
Pacific Lamprey (*Entosphenus tridentatus*)	R6S	Yes (reintroduced in 2014 and 2015)		X		
Western Ridged Mussel (*Gonidea angulata*)	R6S	Suspected		X		X

Species	Proposed Action					
	Status	Documented in Analysis Area	No Effect	MIIH	WIIH	Beneficial Impact
Shortfaced Lanx (*Fisherola nuttalli*)	R6S	Suspected		X		
Columbia Pebblesnail (*Fluminicola fuscus*)	R6S	Suspected		X		
California floater (*Anodonta californiensis*)	R6S	Suspected		X		

MIIH - May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
WIIH - Will impact individuals or habitat with a consequence that the action will contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Redband Trout (*Oncorhynchus mykiss gibbsi)*

Redband trout, the resident form of *Oncorhynchus mykiss*, are a Region 6 sensitive species and a WWNF management indicator species (MIS). Redband trout in the project area likely shared a common gene pool with Snake River steelhead. Redband trout are widely distributed in the Bird Track Springs project area and occupy all Category 1 streams; approximately 1.9 miles of existing habitat.

Alternative 1 - No Action

The No Action alternative would have ***no impact to individual redband trout and their habitat*** (NI) on redband trout in the short term, but has degraded habitat persists, there could be adverse effects to individuals. Most likely they would not occupy this area particularly at times of year when conditions are unfavorable due to stream temperature.

Alternative 2 - Proposed Action

The Proposed Action Alternative ***may impact individual redband trout and their habitat*** (MIIH), but will not likely contribute toward federal listing or loss of viability to the population or species. Effects from all project activities are disclosed in the Fish and Aquatic Habitat and Species Analysis, and the MIS Analysis. Project activities would have local short term adverse effects to fish inhabiting the project area when channel construction and large wood habitat construction occurs. Construction areas would be isolated and fish would be removed either with traps, nets or electrofishing. Handling of fish would be minimal and fish would be released at a designated location upstream of project activities to avoid effects to water quality from increased sediment and turbidity.

Pacific Lamprey (*Entosphenus tridentatus*)

Until 2015, Pacific lamprey only existed as a small remnant population in the upper GRR. In 2015 the Confederated Tribes of the Umatilla began a translocation program. In the spring of 2015, 450 adult lamprey were introduced into the Grande Ronde near Starkey and in 2016, 400 adults were introduced into the upper GRR to jump-start the remnant population (Johnson 2017). Pacific Lamprey have varying life history, but in the upper GRR they have been documented as spawning in tributaries to the Grande Ronde in spring to early summer (Johnson 2017). The most vulnerable life stage for Pacific Lamprey are when they are eggs in a redd (approximately 30 days) and when they hatch into larvae called ammocoetes and drift downstream to slow velocity areas. At this stage, they live in silts/sand substrates and filter feed for 3-7 years.

Desirable habitat for pacific lamprey include:

- Stream and river reaches that have relatively stable flow conditions (sustained increases or decreases that take place over days and weeks rather than hours) and that are not extreme or flashy, offer the best opportunities to support all life stages of lampreys;
- Large substrates (i.e. very large cobble and boulders) submerged in low or no flow areas of rivers and streams may provide high quality adult overwintering habitat.
- Areas of small to medium cobbles, free of fine sediment, serve as spawning habitats. Spawning habitats created or enhanced for salmonids are generally compatible with the needs of lampreys;
- Depositional areas, including alcoves, side channels, backwater areas, pools, and low velocity stream and river margins that recruit fine sands and silts, downstream of spawning areas, provide ideal ammocoete rearing areas and should not be reduced.
- A mix of deep pools, low velocity rearing areas with fine sand or silt, and silt-free cobble areas upstream of rearing areas, all combined with summer temperatures that rarely or never exceed 20° C (68° F), is believed to provide high quality habitat conditions for all life stages.
- Studies with European lamprey species have shown that the occurrence of substantial areas of juvenile lamprey habitat may not signify presence of lamprey populations as populations have a disparate distribution (King et al 2008). However, it is important to maintain the integrity of these areas as their use by lamprey may vary temporally (USFWS 2010).

Alternative 1 - No Action

The no action alternative would have ***no impact to individual pacific lamprey and their habitat*** (NI) in the short term. The lack of deep, low velocity pools, alcoves, side channels and backwater areas, very high summer MWAT that exceed 68°, and overall degraded conditions, which are not suitable for the majority of life stages for pacific lamprey, may impede species recovery in the upper GRR. Inhospitable conditions would be expected to be maintained into the long term.

Alternative 2 - Proposed Action

The proposed action ***may impact individual pacific lamprey and their habitat*** (MIIH) if there are pacific lamprey in the project area in the spawning, egg, or ammocoete stage. Individuals could be directly effected by this project as work areas are isolated (and dewatered) and stream channel disturbance occurs with realignment and habitat structure construction. Effort would be made to relocate ammocoetes during fish salvage, as recommended in US Fish and Wildlife Service's Best Management Practices for Pacific Lamprey (2010). All US Fish and Wildlife Service's Best Management Practices for Pacific Lamprey (2010) should be followed during implementation of instream activities associated with the proposed action.

Overall project restoration would benefit pacific lamprey by improving water quality, increasing side channel habitat, large, deep pools with low velocity, alcoves, backwater areas, adequate sand or silt substrate and spawning gravels and improving floodplain condition and connection.

Shortface lanx (*Fisherola nuttali*)

Shortface Lanx, *Fisherola nuttalli*, is a small pulmonate (lunged) snail in the family Lymnaeidae. Habitat requirements include cold, unpolluted, medium to large streams with fast-flowing, well-oxygenated water and cobble and boulder substrate. These snails are generally found at the edges of rapids. Shortfaced Lanx were historically present throughout much of the Columbia River drainage in Washington, Montana, Oregon, Idaho, and British Columbia. Most populations were extirpated as a result of habitat loss including dams, impoundments, water removal, and pollution. Currently, large populations of *F. nuttalli* persist in only four streams: the lower Deschutes River in Oregon; the Okanogan River and the Hanford Reach of the Columbia River in Washington; and the Snake River in Oregon and Idaho. Additional small populations are found in Oregon in the John Day and Imnaha Rivers, and the lower Columbia River near Bonneville Dam; the Methow River, Washington; and the Grande Ronde River, in Oregon and Washington. Shortfaced Lanx is threatened by habitat alteration and reduced water quality due to dams, impoundments, and siltation and pollution from agriculture, development, industry, and grazing.

There is potential for the shortface lanx (*Fisherola nuttali*) to occur in the 1.9 miles of the mainstem GRR in the project area. The shortface lanx is a large non-migrant freshwater snail. The shortface lanx moves with a slow snail-like crawl, or is subject to transport by stream current. It feeds by scraping algae and diatoms from rock surfaces in the streams but may occasionally feed on other plant surfaces (NatureServe 2009). The species is sporadically distributed at present in the Columbia River and has been verified in a few major tributaries including the Grande Ronde River. The shortface lanx are found in large bodies of water (at least 30 meters and up to 100 meters wide) that are cold, unpolluted, well-oxygenated, perennial, and dominated by cobble-boulder substrate (Neitzel and Frest 1990).

The presence of shortfaced lanx has been documented on the WWNF but has not been confirmed in the analysis area.

Alternative 1 - No Action

The no action alternative would have ***no impact to individual shortfaced lanx and their habitat*** (NI). Local conditions would remain in their current condition.

Alternative 2 - Proposed Action

The proposed action ***may impact individual shortfaced lanx and their habitat*** (MIIH). Isolating and dewatering the channel during instream large wood habitat construction and realignment could affect shortface lanx if they are present in the project area. Effort would be taken to salvage mollusks from work areas when fish are being relocated. Additionally, if shortface lanx are present downstream of the extent of in channel work, individuals could be effected from short term impacts to water quality from increased sediment and turbidity. Water quality and turbidity monitoring would mitigate effects by stopping work if turbidity downstream increased to 10% above the control site upstream of project work.

Overall long term effects to aquatic habitat would benefit shortfaced lanx because habitat requirements such as clean, cold, well-oxygenated water with gravel, cobble, and bolter substrate would be improved from current conditions.

Columbia pebblesnail (*Fluminicola fuscus*)

The Columbia pebblesnail is found in larger tributaries and rivers, on upper surfaces of stable rocks, boulders and bedrock outcrops in fast current, in relatively shallow water. This species requires cold water with high oxygen content, so is not found behind impoundments, or where water is warm, slow, nutrient-enriched or turbid. These snails feed by scraping bacteria, diatoms and other perilithic organisms from rock surfaces. These snails occasionally feed on aquatic plant surfaces. Columbia pebblesnail habitat is generally areas with few aquatic marcophytes of epiphytic algae. This species have been documented on the Wallowa-Whitman National Forest, but it is not certain whether they occur in the project area.

Alternative 1 - No Action

The no action alternative would have ***no impact to individual Columbia pebblesnail and their habitat*** (NI). Local conditions would remain in their current degraded condition. It is not likely that this species would occur in this stretch of the upper GRR since temperatures reach extreme highs in the summer months.

Alternative 2 - Proposed Action

The proposed action ***may impact individual Columbia pebblesnail and their habitat*** (MIIH). Because water temperature in the GRR at the project area location is extremely elevated during summer months (including the July 1-31 in channel work window ODFW 2008), it is not expected that these species would be present during project implementation. This species is so small (7.0 – 11.2 mm height), that it would be difficult to identify and/or relocate individuals if they are encountered during project implementation. Long term effects would have a beneficial effect to habitat for these species by improving hydrologic function and water quality.

California floater (*Anodonta californiensis*)

The California floater is a freshwater bivalve mussel that lives in shallow areas of clean, clear lakes, ponds and large rivers (Taylor 1981) and some reservoirs (Nedeau et al. 2009). Preferred habitat for this species is soft, mud or sand substrate (Clarke 1981) where the mussel can burrow. This species is primarily sedentary and it filter feeds on plankton and other particulate matter suspended in the water column (reviewed by Vaughn et al. 2008). There have been major declines in this species from their historic range, reasons are thought to include a decline in numbers of native host fish, which the larval life stage of the California floater depends, pollution, sedimentation from land use activities like logging and grazing, predation by non-native fish and dam building. There is potential for this species to occur in the project area.

Alternative 1 - No Action

The no action alternative would have ***no impact to individual California floaters and their habitat*** (NI). Local conditions would remain in their current degraded condition.

Alternative 2 - Proposed Action

The proposed action ***may impact individual California floaters and their habitat*** (MIIH). There could be short term adverse effects to individuals in this species if they occur in the project area. Anodontid mussels have relatively low tolerance to fine sediment embeddedness. Effort would be made to salvage and relocate any mussels found in work areas when they are isolated and before they are dewatered. These mussels are less than 5 inches, but large enough to identify and salvage from areas of in channel disturbance as these areas are isolated and before they are dewatered.

There would be long term beneficial effects to habitat for the California floater since they rely on native host fish and there would be benefits to fish species and habitat by implementing the proposed action. In addition, through improving channel complexity and stabilizing banks, there would be decreases in erosion and sedimentation through lateral migration of the channel and eroding banks.

Western Ridged Mussel (*Gonidea angulata*)

The Western ridged mussel occur in large tributaries of the Snake River and Columbia River in Washington, Oregon and Idaho. These mussels occur in streams of all sizes. They are mainly found in low to mid-elevation watersheds, and do not typically inhabit high elevation headwater streams where western pearlshell can be found. They are somewhat tolerant of fine sediments and can occupy depositional habitats and banks. Western ridged mussel can withstand moderate amounts of sedimentation, but are usually absent from habitats with unstable or very soft substrate.

Alternative 1 - No Action

The no action alternative would have ***no impact to individual California floaters and their habitat*** (NI). Local conditions would remain in their current degraded condition.

Alternative 2 - Proposed Action

The proposed action ***may impact individual western ridged mussels and their habitat*** (MIIH) if they occur in the project area. Short term effects could impact the western ridged mussel within the 1.9 miles of mainstem GRR if they occur in the project area or immediately downstream of the project area. Short term increase in sediment and turbidity associated with in channel work is expected to have minor, short term effects to water quality, which could affect individuals. Effort would be made to salvage and relocate these mussels when work areas are isolated and before or during the time that the channel is dewatered so that individuals do not get stranded. These mussels would be redistributed upstream to an area of adequate habitat. Long term effects on fish and aquatic habitat would be expected to benefit the western ridged mussel as hydrologic function and habitat recover.

Essential Fish Habitat

Essential Fish Habitat (EFH) has been designated by NMFS within the Upper Grande Ronde Basin under the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (NMFS 2007). EFH includes all Chinook habitat. There would be short term sediment impacts during the construction phase of the project, however long-term effect on EFH would be beneficial. The project area within the Upper Grande Ronde is within Essential Fish Habitat and would have short term adverse effects on quality of Chinook salmon habitat in the existing 1.9 miles of the GRR in the project area. These short term effects would be caused from a short term increase in sediment and turbidity. However, implementing mitigation measures is expected to minimize adverse effects to EFH.

8. Monitoring

- Implementation monitoring would include following the HIP III Turbidity Monitoring Protocol, ODEQ water quality observations and documentation, ensuring erosion control measures are functioning
- Turbidity standards and monitoring would be required 300 feet downstream of habitat disturbing activities during the project.
- Effectiveness monitoring would occur to assess instream habitat and stream channel changes within the project area would be monitored by establishing a series of photo points and by evaluating plan-form channel changes from periodic aerial photography.
- Intensive spawning ground surveys for Chinook salmon and steelhead would continue.
- All roads associated with the project would continue to be treated and monitored for invasive plants into the future as necessary.
- Effectiveness monitoring would be accomplished by using the Aquatic Inventory protocol, and Columbia Habitat Monitoring Program Scientific Protocol for Salmonid Habitat Surveys. There is existing pre restoration data using these survey methods. Instream habitat and stream channel changes within the project area would be monitored by establishing a series of photo points and by evaluating plan-form channel changes from periodic aerial photography.

9. Project Design Criteria and Mitigation Measures related to fish, fish habitat and water quality

Equipment and Equipment Access Trails

- Ground-based machinery would stay within designated areas in order to minimize the amount of area in a detrimental soil condition, and not exceed 20% Regional Soil Quality Standard. Equipment disturbance would primarily be confined within timber harvest units on private land (skid trails and landings), temporary access trails to the river, and staging/stockpile areas.
- Equipment would be stored, fueled and serviced a minimum of 150 feet from any natural water body or wetland.
- Biodegradable lubricants and fluids shall be used on equipment operating in and adjacent to the stream channel and live water.
- Equipment would be inspected daily for fluid leaks before leaving the vehicle staging area for operation within 150 feet of any natural waterbody or wetland.
- Equipment operations would occur during the dry season (June through September) when soil moisture conditions are less vulnerable. If wet soil conditions exist at time of operations, equipment should be re-located to more suitable area, or operations temporarily suspended until conditions improve.

Rootwad Tree Harvest

- Ground-based equipment should generally be limited to slopes less than 30%.
- Remove as much soil and rock material from tree root systems as possible before trees are removed from the site. Soils in gap openings disturbed through tree removal should be re-contoured as much as possible to resemble pre-activity surface soil conditions. This should include filling of deeper holes and leveling of berms using materials onsite.
- PACFISH/INFISH Biological Opinion Riparian buffers would be implemented, no trees would be harvested or skid trails located within these buffers.
- Harvest would occur during the dry season to avoid adverse effects to soils such as compaction and adverse effects to run off patterns from soil compaction.
- Applicable federal and state timber harvest standards would be followed. This includes stream buffer widths, fire restrictions, and site rehabilitation.

Instream Structures

- All work below ordinary high water would occur in compliance with the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (2008). The in water work window for this area of the Grande Ronde is July 1-31, a time when salmonids are at their least vulnerable life stages.
- All logjams will be designed and constructed to remain stable during 100 year flood events. A large portion of each structure will be buried below the streambed.
- Any work area within the wetted channel will be isolated from the active stream where ESA listed fish occur. Fish will be removed from construction areas and channels will be dewatered to mitigate direct and indirect effects to fish and water quality, following HIP III protocol. Work area isolation and fish salvage will follow methodologies outlined in HIP III.

- Introducing stream flow to newly constructed channel areas will follow the HIP III staged rewatering plan to mitigate for sediment and turbidity pulses downstream. Downstream monitoring will occur following the HIP III Turbidity Monitoring Protocol.
- All heavy equipment operating with the active stream channel would utilize vegetable oil instead of hydraulic oil to mitigate impacts from potential spill or leak.

Erosion Control

- Temporary erosion controls would be in place before any significant alteration occurs and appropriately installed downslope of project activity within the riparian buffer area until site rehabilitation is complete
- Temporary erosion control measures may include fiber wattles, silt fences, jute matting, wood fiber mulch and soil binder, or geotextiles and geosynthetic fabric.
- Materials for emergency erosion control measures will be on site including oil-absorbing floating boom wherever surface water is present.

Temporary Roads to Access the River

- Temporary roads would be carefully located in places that would require minimal grubbing and clearing (approximately 12 feet wide) of existing trees and vegetation. These roads would be restored to the pre-activity conditions. Any rutting or berms shall be repaired with deep ripping and drainage structures installed to control surface runoff as needed. All exposed soils would be seeded/planted.
- All reopened roads and major equipment trails accessed from system roads shall have a permanent closure berm placed at road intersection to prevent unauthorized motorized use.

Site Restoration Construction Areas

- All streambanks, soils, and vegetation will be cleaned up and restored as necessary using stockpiles large wood, topsoil, and native channel material
- All project related waste will be removed.
- All temporary access roads, crossings, and staging areas will be obliterated. When necessary for revegetation and infiltration of water, compacted areas of soil will be loosened.
- All disturbed areas will be rehabilitated in a manner that results in similar or improved conditions relative to pre-project conditions. This will be achieved through redistribution of stockpiled materials, seeding, and/or planting with local native seed mixes or plants

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